Visualizing Visualization

Kevin R. Tyle, University at Albany, SUNY

Unidata Russell L. DeSouza Award Seminar
It started with a Big Splash …

(Apollo 11 Splashdown, 7/24/1969)
1) Visualization Way Back When
2) Visualization in the “Modern” Era
3) Interactivity in Applications
4) Interactivity in the Browser
5) WxAtlas
6) Visualizing the Future
7) Acknowledgments
Visualization Way Back When
FORECASTS AND GENERAL WEATHER INFORMATION
UNITED STATES WEATHER BUREAU, WASHINGTON, D.C.
1:30 a.m., E.S.T., THURSDAY, JULY 1, 1948

STATE FORECASTS

District of Columbia, mostly sunny and somewhat cooler and less humid, with highest temperature around 85° to-day; clear and cooler tonight, with lowest temperature about 68°; Friday sunny and dry with little change in temperature.

Maryland, New Jersey, and Delaware, mostly sunny and somewhat cooler and less humid to-day; clear and cooler to-night; Friday sunny and dry with little change in temperature.

Eastern New York and Eastern Pennsylvania, partly cloudy and cooler to-day; clear and cooler to-night; Friday mostly sunny and dry with little change in temperature.

Virginia, fair and somewhat cooler and less humid to-day, except scattered afternoon thunderstorms in southeast portion; clear and cooler to-night; Friday sunny and dry with little change in temperature.

Eastern New York and Eastern Pennsylvania, partly cloudy and somewhat cooler and less humid to-day; clear and cooler to-night; Friday mostly sunny and dry with a little warmer in the afternoon.

VIRGINIA WEATHER BUREAU
FEB 28 1949
72800

The maps shown here are prepared from observations and other weather data and statistical information obtained throughout North America. The observations taken at 1:30 a.m. E.S.T. at approximately two hundred selected stations are assembled in the large sectional map of the United States, southern Canada, southern Mexico, and Cuba. A complete explanation of these maps (including all symbols and colors) is printed (infront) on the reverse side. Periodically, during each month, the maps are revised to correct any errors or omissions.

Visualizing Visualization – Kevin Tyle
1st US Operational NWP Map

Forecasts for 5 January 1949 (P. Lynch, BAMS 2008)

Visualizing Visualization – Kevin Tyle
1st Satellite Image

FIRST TELEVISION PICTURE FROM SPACE
TIROS I SATELLITE APRIL 1, 1960
Radar Imagery (WSR-57)

Hurricane Donna (1960)
6 May 1975 Severe Weather Exercise.

Included in the package are:

- a) one overlay grid with state boundaries and marks for use in registration;
- b) overlays for 1800 and 2100 with analysis of various features;
- c) 1 km resolution visible pictures at 30 minute intervals from 1800 GMT to 2134 GMT

Needed to be supplied:
- a) masking tape;
- b) grease pencil, (optional).

General instructions: Seeing changes between pictures at different times

The exercise may be done using all of the pictures, or only a portion of the pictures with the remainder being added at a later time. The same general steps are followed regardless of the number of pictures being used. They are:

- a) tape down the top and bottom of the 1800 GMT picture;
- b) register the grid to the 1800 GMT picture using the registration marks, tape down the left hand edge of the overlay grid. The edge should be taped so that the grid may be folded back away from the picture(s) beneath it.
- c) take the next picture in sequence and place it beneath the overlay grid, aligning its registration marks to those on the overlay grid. Be careful not to move the picture, fold back the grid and tape down the top edge of the picture. Replace grid and check the registration.
- d) fold the grid back away from the pictures. Holding the bottom edge of the top picture, raise and then lower it in a sort of fanning motion (so that the bottom picture comes into view and then is covered again by the top picture). By doing this, one may observe the changes which have occurred between the two pictures. Practice this fanning at various speeds.
- e) repeat step c with the remainder of the pictures. Each time a new picture is added to the sequence, "fan it" to observe changes between it and the previous picture. Note that this picture may be compared with any previous picture merely by holding more than one picture while "fanning."

UAlbany Synoptic Lab Assignment (1970s)
Visualization in the “Modern” Era
McIDAS

Visualizing Visualization – Kevin Tyle
GrADS

Visualizing Visualization – Kevin Tyle

°F at 02Z Tue 17 OCT, 2017
CONPACK EXAMPLE 15
The routines CPCHHL and CPCHLL are used below to suppress labels over land. They are also used to modify colors and line widths used for the labels.
NCL

wrfout_d01_2005-12-14_13:00:00

Visualizing Visualization – Kevin Tyle
Radar Imagery (WSR-88D)
Stepping I”N”to I”N”teractivity: N-AWIPS
NMAP(2)

Visualizing Visualization – Kevin Tyle
NSHARP

Visualizing Visualization – Kevin Tyle
3-D Visualization: Vis5D, IDV
Visualizing Visualization – Kevin Tyle
Visualization Products: Static Graphics
Real Time Model Guidance (GFS & NAM)

Real Time Mesoscale Analysis (RTMA)
Python

Visualizing Visualization – Kevin Tyle
Interactivity in the Browser
Hint.wind.fm and its Offspring

Visualizing Visualization – Kevin Tyle
Visualizing Visualization – Kevin Tyle
WMS / OpenLayers / Leaflet

Leaflet

Certified OGC Compliant

WMS 1.3.0
WFS 1.1.0
WCS 1.0.0

Visualizing Visualization – Kevin Tyle
Visualizing Visualization – Kevin Tyle
"Nullschool" with winds on DT
WxAtlas: Leveraging Databases
Visualizing Visualization – Kevin Tyle
Larry Gloeckler (UAlbany DAES) and AVAIL (UAlbany Geography & Planning)
The Future
Alexa / Siri
Alexa / Siri

Visualizing Visualization – Kevin Tyle
“Give me a weather map for the blizzard of 1993”

Sorry, Kevin, I can’t get weather for dates in the past.
GPU Visualization

Leigh Orf’s Tornado Visualization: http://orf.media/
Acknowledgments
Visualizing Visualization – Kevin Tyle
Steve Chiswell “Chiz”
Larry Gloeckler & AVAIL

Visualizing Visualization – Kevin Tyle
Tom Yoksas

Visualizing Visualization – Kevin Tyle
And one final admonition before we adjourn ...
And one final admonition before we adjourn ...

Always remember to run `gpend!!`
Thank you!!!

Questions?
Extra Slides
okay, so I've looked a little deeper and here's how it breaks down:
~65% raw gridded data - 700GB/1.07TB
~33% indexes - 350GB/1.07TB
the remaining ~2% comprises header tables, coefficient tables, and sequences
so the large majority makes up just raw gridded data
and... "also ... is any of the grid info transmitted in JSON? Or is it all just read in from postgres?"
yes, the data is pulled from the database and serialized to a JSON formatted string
we use the simplejson library to do that, and 'dumps' method
i.e., simplejson.dumps(data)
the serialized JSON string looks like:
{'header': {'lo1': 0, 'la1': 90, 'dx': 2.5, 'dy': 2.5, 'nx': 144, 'ny': 73}, 'data':
[long_list_of_all_data_values_to_be_plotted]}
in other words, it's just a JavaScript object of key, value pairs
keys are 'header' and 'data', and values are either another object of key, value pairs, or a list containing the actual data
the data structure is analogous to nested dictionaries in Python
that's how JS handles data
and that's how Cambecc formats his data -- he runs the grib files through the grib2json converter and produces exactly what I showed above